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13. ABSTRACT (Maximum 200 words)
This program supported the visit of Professor V. F. Nesterenko, Lavrentiev Institute of Hydrodynamics, Novosibirsk, Russia to UCSD, La Jolla, CA. Associated research focused on shock- and shear-initiated chemical reactions and the use of the thick-walled cylinder method for the generation of high shears at high strain rates. The program was successfully completed with the firm establishment of collaborative research and opening of new research areas.

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A FUNDAMENTAL INVESTIGATION OF SHOCK-INDUCED REACTIONS:
THE ROLE OF PLASTIC DEFORMATION AND SYNTHESIS
OF ULTRA HARD MATERIALS

FINAL TECHNICAL REPORT

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The research program was successfully completed and all objectives in the original proposal were accomplished. Dr. Nesterenko's stay at UCSD was extended and culminated with the offer for a position of Associate Professor in Residence, that he accepted. He was promoted to Full Professor (with tenure) in July 1998. The research program resulted in the publication of a considerable number of papers, that have already been submitted to the US Army Research Office. The following are the main accomplishments of the program:

1. It was demonstrated that intense plastic deformation occurring in shear localization can lead to exothermic chemical reactions in the Nb-Si and Ti-Si systems.
2. It was shown that shear localization can be observed in tantalum under extreme conditions of loading, which are experienced in the thick-walled tube geometry.
3. Damage evolution under dynamic deformation was investigated in alumina and silicon carbide. An in-depth analysis of ceramic comminution under impact conditions was carried out.
4. The self-organization of shear bands in titanium was demonstrated and quantified. This work was done in collaboration with Dr. T. W. Wright, u. S. Army research Laboratory.
5. Prof. Nesterenko is completing his book; it is expected to be published by Springer in 2001.

A list of papers published as a result of this research program and interactions after its conclusion is given below. The papers listed resulted from work in this program and subsequent work initiated during the visit of Prof. Nesterenko.

1. V.F. Nesterenko, M.A. Meyers, H.C. Chen, and J.C. LaSalvia, "Controlled High-Rate Localized Shear in Porous Reactive Media", *Applied Physics Letters*, December 12, 1994, vol. 65, (no. 24), p. 3069-3071. RESEARCH ARTICLE
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8. H.C. Chen, M.A. Meyers, and V.F. Nesterenko, "Shear Localization in Granular and Commuted Alumina", in SHOCK COMPRESSION OF CONDENSED MATTER - 1995, Proceedings of the Conference of the American Physical Society Topical Group on Shock Compression of Condensed Matter, Seattle, August 13-18, 1995, AIP Press, 1996, Edited by S.C. Schmidt and W.C. Tao, p.607-610. CONF PROCEED

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10. D.J. Benson, V.F. Nesterenko, and F. Jonsdottir, "Micromechanics of Shock Deformation of Granular Materials", in SHOCK COMPRESSION OF CONDENSED MATTER - 1995, Proceedings of the Conference of the American Physical Society Topical Group on Shock Compression of CONF PROCEED

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